

AMENDMENTS TO THE CLAIMS:

Please replace the claims with the claims provided in the listing below wherein status, amendments, additions and cancellations are indicated.

1. (Currently amended) A hemodiafiltration apparatus capable of extracorporeal circulation operation in which extraction and reinfusion of blood are performed by using a single needle, comprising: a blood supply system for supplying blood; a dialysis fluid supply system for supplying a dialysis fluid; a control system for controlling movement of a fluid between the two supply systems, a blood circulation system having an arterial side blood circuit for extracting blood from a patient and flowing it into a hemodialyzer and a venous side blood circuit for returning blood from the ~~hemodialyzer~~ hemodialyzer to the patient, at least one of the arterial side blood circuit and the venous side blood circuit of the blood circulation system having a blood pump which can control a flow rate and can operate in normal and opposite directions, the dialysis fluid supply system having a dialysis fluid supply line for perfusing the hemodialyzer with a dialysis fluid and a dialysis fluid discharge line, ~~at least one of the two blood circuits of the blood circulation system having a blood pump which can control the flow rate and can operate in normal and opposite directions, the dialysis fluid supply line and the dialysis fluid discharge line having a supply delivery means for supplying a dialysis fluid and a discharge delivery means~~

~~for discharging the dialysis fluid, respectively,~~ one of the dialysis fluid supply line and the dialysis fluid discharge line having at least one filtration/back-filtration fluid supply means for carrying out filtration and back-filtration together with the delivery means, which can operate in normal and opposite directions and can control a flow rate, at least one water removing and fluid discharge means, and having a mechanism for extracting blood into the blood circuit by flowing out a fluid in the blood circuit to a dialysis fluid circuit side by filtration through the hemodialyzer accommodating a hollow yarn membrane and a mechanism for returning the blood in the blood circuit to the patient by flowing the dialysis fluid from the dialysis fluid circuit side to the blood circuit side by forced back- filtration through the hemodialyzer,

a mechanism capable of repeating intermittently and at least a plurality of times an operation of flowing out a fluid from the blood circuit side to the dialysis fluid circuit side by filtration and the operation of flowing the fluid into the blood circuit side from the dialysis fluid side by back-filtration.

2. (Previously presented) A hemodiafiltration apparatus according to claim 1, comprising: a blood circuit for a single needle having a Y-shaped or T-shaped junction portion with a puncture needle; and two branch circuits branching off from the junction portion , one of said branch circuits being an arterial side branch on an upstream side of the hemodialyzer and another branch being a venous side branch on a downstream side of the hemodialyzer during the circulation of

blood, wherein a blood circuit having a pump segment for mounting a blood pump to one of the two branch circuits is used to enable hemodiafiltration with a single needle.

3. (Previously presented) A hemodiafiltration apparatus according to claim 1, wherein the filtration operation and the back-filtration operation are automatically repeated alternately.

4. (Currently amended) A hemodiafiltration apparatus according to claim 1, wherein a blank ~~phase having an arbitrary length~~ time (blank phase) during which neither filtration operation nor back-filtration operation is carried out is interposed in an arbitrary length between the filtration operation and the back-filtration operation or between the back-filtration operation and the filtration operation.

5. (Currently amended) A hemodiafiltration apparatus according to claim 4, wherein a step of carrying out blood circulation in the blood circuit in ~~the said blank phase having an arbitrary length during which neither filtration operation nor back-filtration operation is carried out is interposed between the filtration operation and the back-filtration operation or between the back-filtration operation~~

~~and the filtration operation to repeat the operation~~ is repeated in an operation carried out automatically.

6. (Currently amended) A hemodiafiltration apparatus according to claim 2, wherein the blood of the patient is extracted into a blood circuit of one branch by ~~making~~ providing for a fluid supply rate from the patient side to the hemodialyzer side of the blood pump ~~provided~~ in at least one of the blood circuits and a filtration rate through the hemodialyzer being equal to each other in the filtration operation.

7. (Previously presented) A hemodiafiltration apparatus according to claim 2, wherein the blood pump provided in at least one of the blood circuits is stopped and the blood of the patient is extracted into the blood circuit of one branch by filtration through the hemodialyzer in the filtration operation.

8. (Currently amended) A hemodiafiltration apparatus according to claim 2, wherein the blood in the blood circuit of one branch is returned to the patient by ~~making~~ providing for the fluid supply rate from the ~~hemodialyzer~~ hemodialyzer side to the patient side of the blood pump ~~provided~~ in at least one of the blood circuits and a back-filtration rate through the hemodialyzer being equal to each other in the back-filtration operation.

9. (Previously presented) A hemodiafiltration apparatus according to claim 2, wherein the blood pump provided in at least one of the blood circuits is stopped and the blood in the blood circuit of one branch is returned to the patient side by the back-filtration through the hemodialyzer in the back-filtration operation.

10. (Previously presented) A hemodiafiltration apparatus according to claim 1, wherein the blood of the patient is extracted into the blood circuit through the venous side and the arterial side of the blood circuit based on the ratio of the fluid supply rate from the patient side to the hemodialyzer side of the blood pump provided in at least one of the blood circuits to the filtration rate through the hemodialyzer in the filtration operation.

11. (Previously presented) A hemodiafiltration apparatus according to claim 2, wherein the blood of the patient is extracted into one branch extending toward the hemodialyzer side of the blood pump provided in at least one of the blood circuits from a single needle based on the ratio of the fluid supply rate from the patient side to the hemodialyzer side of the blood pump provided in at least one of the blood circuits to the filtration rate through the hemodialyzer in the filtration operation, and the amount of the blood corresponding to the difference between the rate of the blood pump and the filtration rate is re-circulated from one

branch side where no blood pump is provided to the branch side where the blood pump is provided.

12. (Currently amended) A hemodiafiltration apparatus according to claim 1, wherein all or a part of the blood in the blood circuit is returned to the patient side through the venous side and the arterial side of the blood circuit based on the ratio of the fluid supply rate from the hemodialyzer side to the patient side of the blood pump ~~provide~~ provided in at least one of the blood circuits to the back-filtration rate through the hemodialyzer in the back-filtration operation.

13. (Currently amended) A hemodiafiltration apparatus according to claim 2, wherein the blood in the blood circuit is supplied from one branch side where the blood pump is not provided ~~of~~ in the blood circuit to the junction portion of the two branch circuits based on the sum of the fluid supply rate from the patient side to the hemodialyzer side of the blood pump provided in at least one of the blood circuits and the back-filtration rate through the hemodialyzer, and the blood is re-circulated from one branch side where the blood pump is not provided to the other branch side where the blood pump is provided at a rate of the blood pump while the blood is returned to the patient side at a back-filtration rate with a single needle through the junction portion of the two branch circuits.

14. (Previously presented) A hemodiafiltration apparatus according to claim 4, wherein water removing and dialyzing which includes perfusion of the hemodialyzer with a dialysis fluid are provided in the blank phase between the filtration operation and the back-filtration operation or between the back-filtration operation and the filtration operation while the blood in the blood circuit is circulated.

15. (Currently amended) A hemodiafiltration apparatus according to claim 14, wherein the water removing is carried out by activating the water removing and fluid discharge means in one or ~~more~~ more of the filtration phase, back-filtration phase and blank phase set in an arbitrary ratio independently of the filtration/back-filtration fluid supply means.

16. (Currently amended) A hemodiafiltration apparatus according to claim 14, wherein the water removing includes maintaining an inside volume of the circuit constant by extracting the blood in an amount equal to an amount of the removed fluid from the patient side in.

17. (Previously presented) A hemodiafiltration apparatus according to claim 1, wherein an amount of movement of the fluid by each operation, including the amount of filtrate or amount of reverse filtrate, is calculated

from the product of a moving rate of the fluid by each operation, including the filtration rate or back-filtration rate, and a time required for each operation.

18. (Currently amended) A hemodiafiltration apparatus according to claim 4, wherein when a minimum recurring unit comprised of a combination of an arbitrary ~~numbers~~ number and the order of a series of filtration phases, back-filtration phases and blank phases is taken as one cycle, a time of the back-filtration operation in each cycle is set shorter than a time of the filtration operation in the same cycle, and the back-filtration rate in each cycle is set higher than the filtration rate in the same cycle.

19. (Previously presented) A hemodiafiltration apparatus according to claim 1, wherein when a total time required for an entire hemodiafiltration step is taken as working time, the number of cycles which are carried in the working time can be set to any value.

20. (Currently amended) The hemodiafiltration apparatus according to claim 1, wherein when the amount of the body fluid removed to correct an excess of the body fluid of the patient is taken as the amount of the removed water, a total amount of a reverse filtrate ~~flow~~ which flows by the back-filtration operation as a total amount of a substitution fluid which is equal to a total amount of a filtrate

flowing out by the filtration operation and the number of cycles, each comprised of at least the filtration operation and the back-filtration operation, as the number of cycles in the hemodiafiltration step over the working time, the hemodiafiltration step with a single needle is manipulated or controlled over the working time by setting at a beginning of the hemodiafiltration step the working time, the amount of the removed water, the amount of the substitution fluid and the number of cycles.

21. (Currently amended) A hemodiafiltration apparatus according to claim 1, wherein the hemodiafiltration is performed by using a single needle which is manipulated or controlled by inputting the amount of the removed water and the total amount of the substitution fluid, which is equal to the total amount of filtrate which flows out by the filtration operation.

22. (Previously presented) A hemodiafiltration apparatus according to claim 1, wherein when there is no input of the working time or the number of cycles, the hemodiafiltration is manipulated or controlled with an initial value set into an input unit.

23. (Previously presented) A hemodiafiltration apparatus according to claim 1, further comprising polyfunctional filtration control means which enables the filtration/back-filtration rates and the times of the filtration phase,

the back-filtration phase and the blank phase to be set to any values by means of one fluid supply means which can operate in normal and opposite directions in place of at least one filtration/back-filtration fluid supply means and at least one water removing and fluid discharge means in the hemodiafiltration apparatus.

24. (Currently amended) A hemodiafiltration apparatus according to claim 23, wherein when the amount of a fluid discharged from the dialysis fluid circuit by the polyfunctional filtration control means independently of delivery means for discharging the dialysis fluid is taken as the amount of a fluid discharged by a pump, the filtration/back-filtration rate per cycle or ~~par~~ per working time of the polyfunctional filtration control means is adjusted so that the amount of the fluid discharged by the pump becomes the sum of the amount of removed water ~~flown~~ which flows out from the blood side circuit to the dialysis fluid side circuit by the water removing step and the amount of the substitution fluid ~~flown~~ which flows from the dialysis fluid side circuit into the blood circuit by the back-filtration operation.

25. (Currently amended) A hemodiafiltration apparatus according to claim 1, wherein the amount of the fluid discharged by the pump in each cycle is regulated such that the amount of ~~the~~ such fluid ~~discharged by the pump in each cycle~~ becomes the total of the amount of the removed water and the amount of the substitution fluid in each cycle.

26. (Currently amended) A hemodiafiltration apparatus according to claim 1, wherein the amount of water removed per cycle is programmed such that when the amount of water removed by the filtration operation in each cycle is taken as the amount of the removed water from the patient per cycle, the amount of the removed water ~~par~~ per cycle becomes a value obtained by dividing the amount of water removed from the patient by the number of cycles or a time function.

27. (Currently amended) A hemodiafiltration apparatus according to claim 1, wherein when the amount of blood ~~filtrated~~ filtered by the filtration operation in each cycle is taken as the amount of filtration per cycle, the amount of filtration per cycle is calculated as the product of the back-filtration rate and the back-filtration time apportioned to each cycle which is the sum of the products when there ~~are~~ is a plurality of back-filtration phases in one cycle.

28. (Currently amended) A hemodiafiltration apparatus according to claim 23, wherein when a time required for the filtration operation in each cycle is taken as the filtration time per cycle, an amount of a fluid discharged by the filtration/back-filtration fluid supply means and the water removing and fluid discharge means or the polyfunctional filtration control means in the same filtration operation as the amount of the fluid discharged by the pump per cycle, a time required for the back-filtration operation in each cycle as the time of the back-

filtration phase per cycle, and an amount of a fluid ~~flow~~n which flows in by the back-filtration operation as the amount of the substitution fluid per cycle, then the filtration time per cycle, the amount of filtration per cycle and the amount of the fluid discharged by the pump per cycle are automatically set by changing the time of the back-filtration phase per cycle.

29. (Previously presented) A hemodiafiltration apparatus according to claim 1, wherein the time of the back-filtration phase per cycle, the amount of the substitution fluid per cycle and the amount of the fluid discharged by the pump per cycle are automatically set by changing the time of the filtration phase per cycle.

30. (Currently amended) A hemodiafiltration apparatus according to claim 1, wherein the amount of the substitution fluid per cycle or the amount of the removed water per cycle can be altered by changing the amount of the substitution fluid per cycle or the amount of filtration ~~par~~ per cycle.

31. (Previously presented) A hemodiafiltration apparatus according to claim 1, wherein the time required for each cycle can be changed arbitrarily in each cycle.

32. (Currently amended) A hemodiafiltration apparatus according to claim 4, wherein when a filtration/back-filtration pattern ~~par~~ per cycle is comprised of time apportionment to the filtration phase, the back-filtration phase and the blank phase per cycle and settings for the amount of filtration, the amount of the substitution fluid and the water removal rate or amount, if the filtration/back-filtration pattern per cycle is initialized or changed, the filtration/back-filtration pattern for cycles after ths set cycle is set to be the same or is changed.

33. (Currently amended) A hemodiafiltration apparatus according to claim 1, wherein the ~~set~~ water removing conditions and the filtration/back-filtration pattern for each cycle are set and can be automatically changed by feed-back control from ~~measuring~~ means for measuring the hematocrit value, the amount of the circulating blood, and the blood pressure.

34. (Currently amended) A hemodiafiltration apparatus according to claim 1, wherein the ~~filtration/filtration~~ filtration/back filtration pattern of each cycle are set and can be changed to attain a water removing rate set by an ultrafiltration water removing program for changing the water removing rate according to the preset time dependence.

35. (Previously presented) A hemodiafiltration apparatus according to claim 4, wherein the cycle is comprised of one or more filtration phases, one or more back-filtration phases and the number and the order of 0, one or more blank phases, and the cycle is repeated at least two times in the working time.

36. (Previously presented) A hemodiafiltration apparatus according to claim 1, wherein the amount of movement of the fluid which includes the amount of a filtrate or the amount of a reverse filtrate in each operation for a given time is calculated from the product or the sum of the products for the given time of the fluid moving rate of each operation which includes the filtration rate or back-filtration rate and the time required for each operation which is the time of the filtration phase or the back-filtration phase.